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Back-Flow Prevention Strategies for Stormwater Lines

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The Tideflex Advantage

*Still
Ahead
of the
Curve!*



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A Pioneer in the Check Valve Industry

- For decades, the wastewater treatment industry has been plagued by billions of gallons of backflow through sewage systems.
- Backflow costs the industry millions of dollars in unnecessary treatment and can upset the biological balance of a treatment plant.
- Traditional flapgate style valves used to stop backflow have proved to be ineffective, as they easily rust, corrode and become blocked.

A Pioneer in the Check Valve Industry

- In 1984, the United States EPA commissioned Tideflex to develop and test an alternative to flapgate valves.
- In their report, *Development and Evaluation of a Rubber “Duck Bill” Tide Gate*, the EPA states, “Increasing the reliability and performance of tidegates has a beneficial impact on the general pollution abatement program for the nation’s waterways.”



A Pioneer in the Check Valve Industry

- In response to the EPA's need, the elastomer "duckbill" Tideflex Check Valve was developed to eliminate the operational and maintenance problems associated with flapgate check valves; including corrosion of mechanical parts, freezing open or shut, warping and clogging due to entrapped debris.



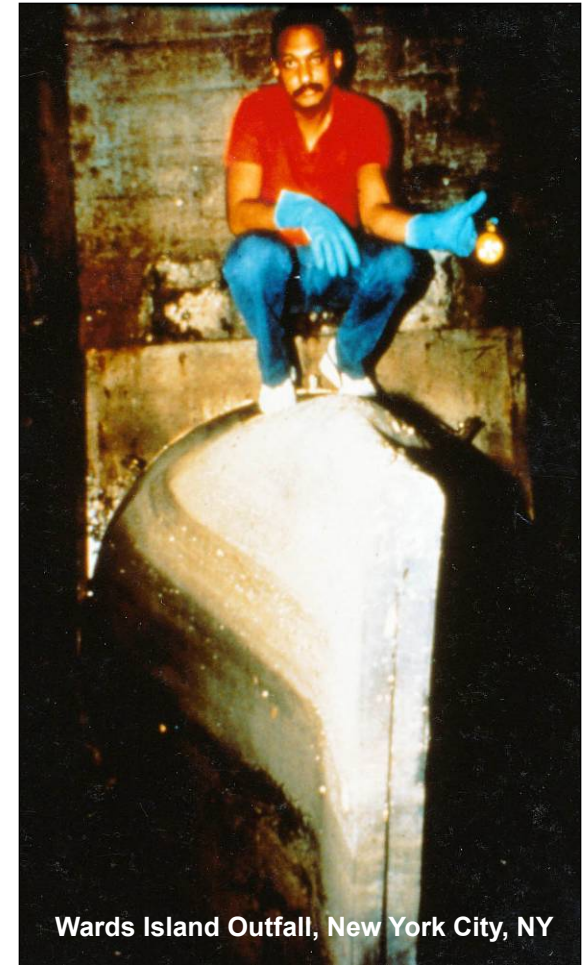
PROBLEM



SOLUTION

A Pioneer in the Check Valve Industry

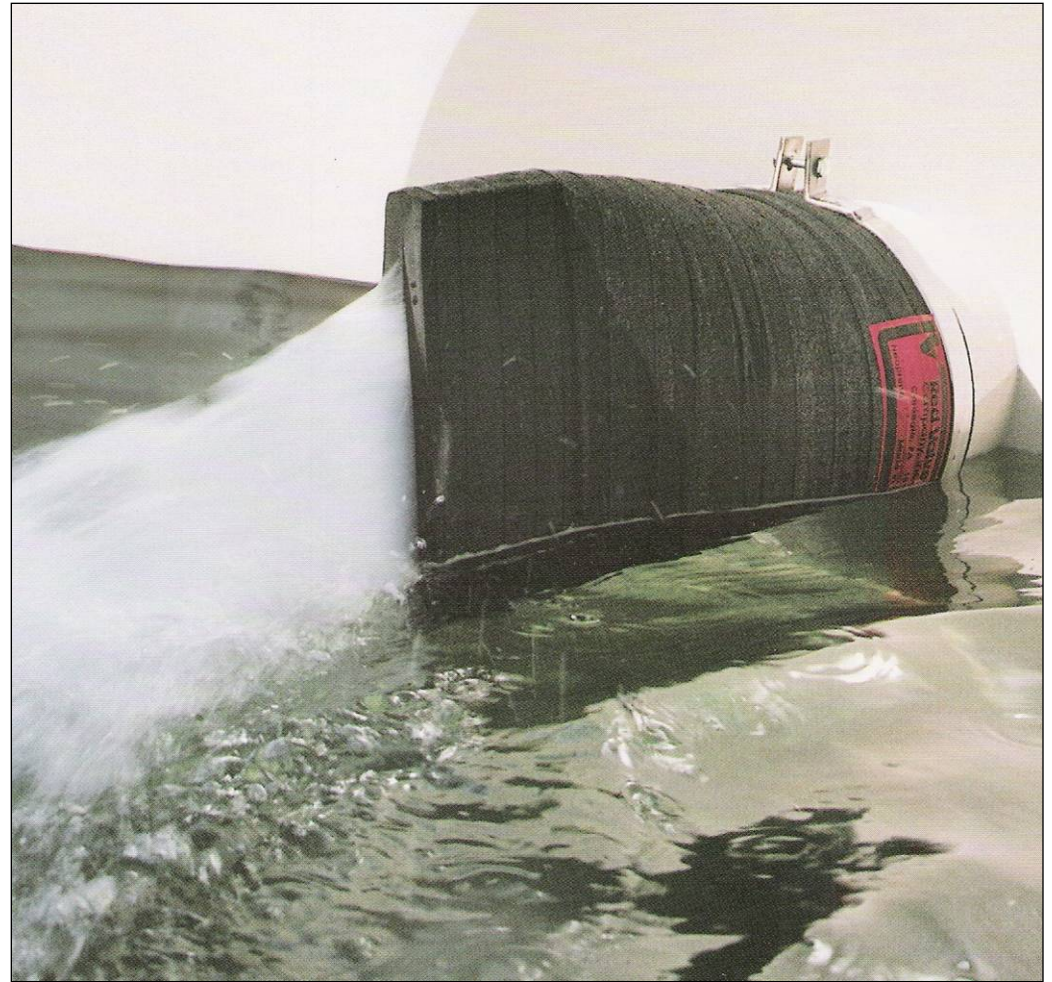
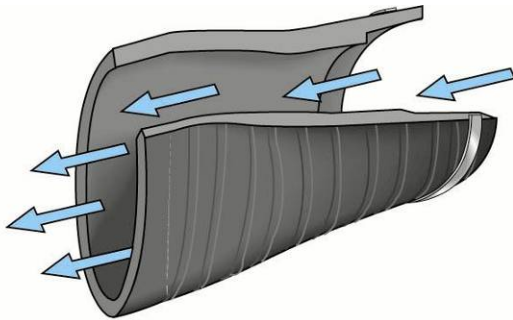
- Since its creation in 1984, years of research and development, testing and proven performance have combined to make the Tideflex Check Valve today's most reliable valve for backflow prevention. The first check valve that Tideflex Technologies sold in 1984 is still in service today.
- Currently, over 600,000 Tideflex Check Valves are solving inflow and intrusion problems around the world.



Wards Island Outfall, New York City, NY

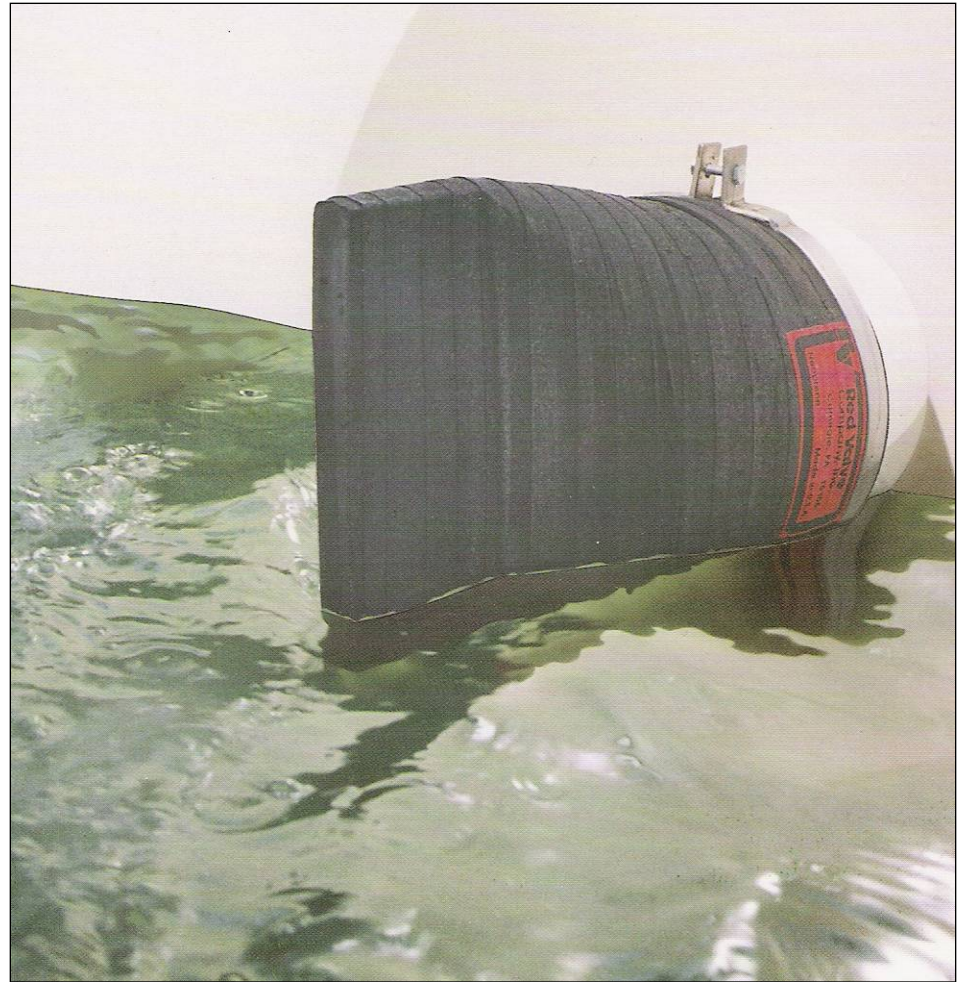
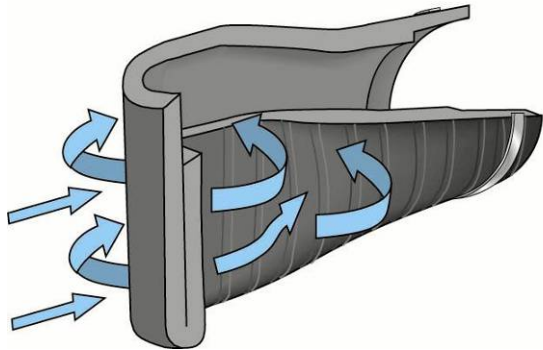
Principle of Operation

- The Tideflex Check Valve opens with positive pressure, permitting flow to go through in one direction.



Principle of Operation

- Reverse pressure seals the bill of the Tideflex Check Valve, stopping flow from the opposite direction. Backflow is prevented or “checked.”



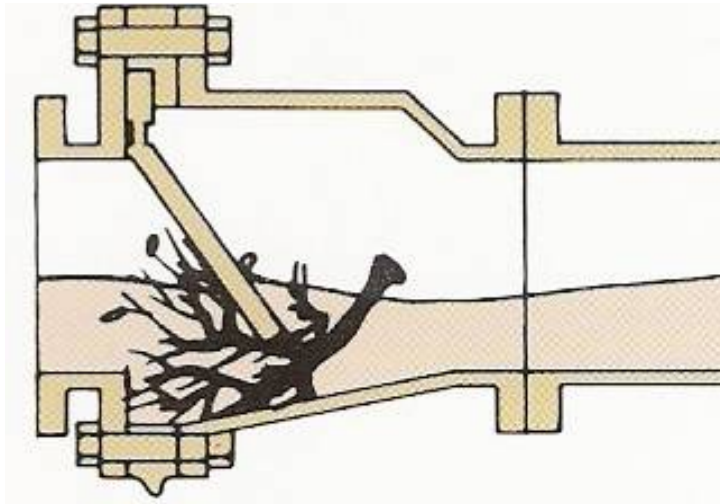
Engineered Features

Tideflex Boasts:

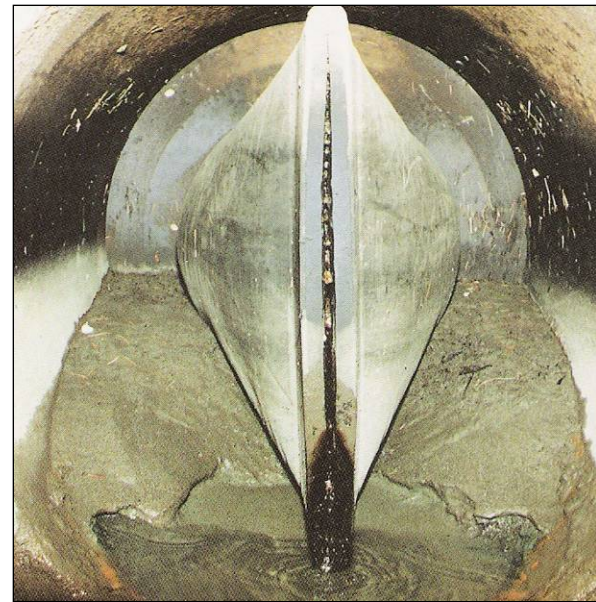
- No moving or mechanical parts.
- 100% elastomer construction.
- Low headloss.
- Sensitive enough to open with as little as 1" of water pressure.
- Custom-built to your flow specifications.
- Cost-effective, reliable replacement for traditional flapgate valves.
- Silent, non-slamming.
- Self-draining, eliminates standing water.

Engineered Features

- All rubber construction allows valves to eliminate blockage by closing tight and forming a seal around debris.



PROBLEM



SOLUTION

Engineered Features

- Tideflex Check Valves require no maintenance or repair, therefore they are much more cost-effective than flapgate valves.
- Unlike a flapgate valve, there are no metal parts to corrode, rust, freeze open or shut.



A badly corroded flapgate valve.

Independent Hydraulic Testing

- Tideflex Technologies has conducted extensive independent hydraulic testing of check valves since the 1980s.



Independent Hydraulic Testing

- Since the 1980's, comprehensive testing of Tideflex check valves has been done and a massive amount of data has been analyzed to model the effect of valve geometry and relative stiffness on hydraulics.
- Only Tideflex Check Valves have been tested from 2"- 48" in numerous hydraulic variations within each size. Valves have been tested for free discharge, submerged and partially submerged conditions.



Independent Hydraulic Testing

- With this extensive amount of test data, Tideflex Technologies developed modeling programs used to provide hydraulic characteristic curves for every Tideflex Check Valve.



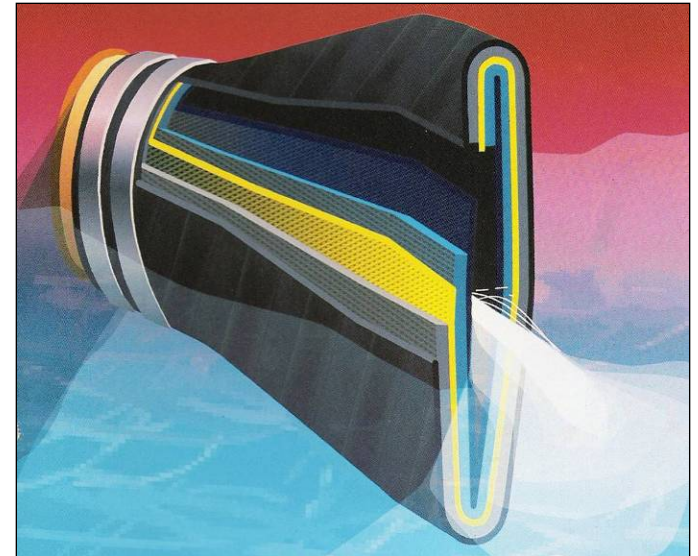
In-house & Field Testing

- To supplement the independent hydraulic testing, Tideflex Technologies continually conducts research and development and testing to improve existing products and to develop new products.
- In addition, extensive field studies are conducted to validate product design for long-term performance.



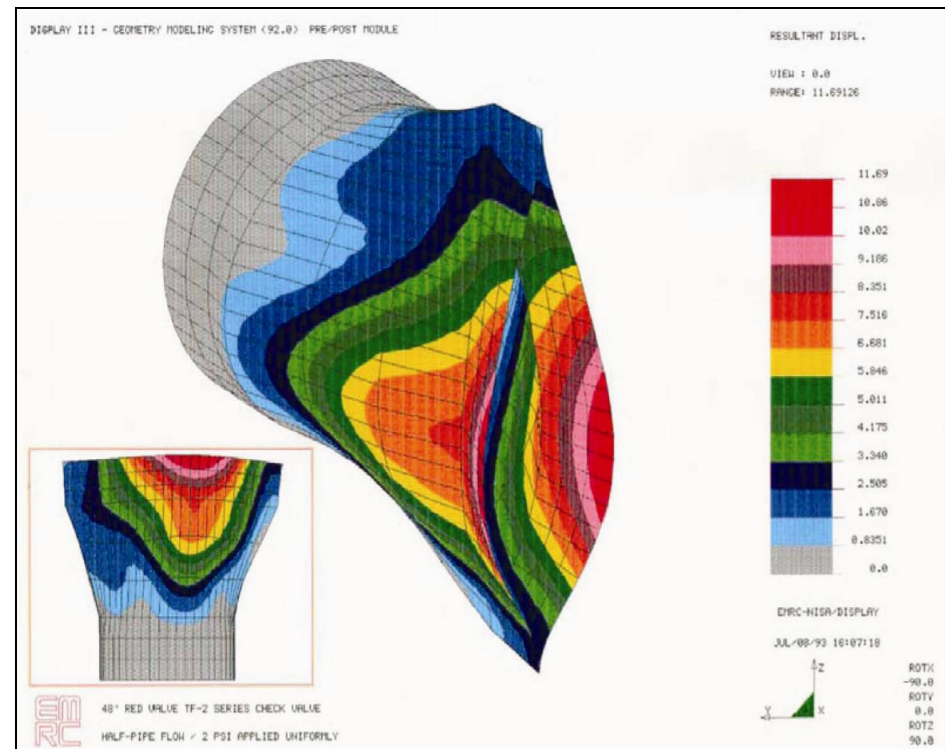
Customized Construction

- From the outside, Tideflex Check Valves appear to be a simple rubber valve manufactured in a duckbill shape. However, for each Tideflex Check Valve there can be hundreds of layers of various natural and synthetic elastomers and fabric-reinforced plies. This allows us to design for drastically different characteristics such as resilience, durometer, compression set resistance, tensile strength and elongation.
- Each Tideflex Check Valve is customized to meet your specific hydraulic needs.



Finite Element Analysis (FEA)

- Modeling was run for discharging and back pressure conditions. These results were used in developing detailed fabrication protocols so that Tideflex Check Valves will withstand all of the long-term variable load conditions, while producing the desired hydraulic characteristics.

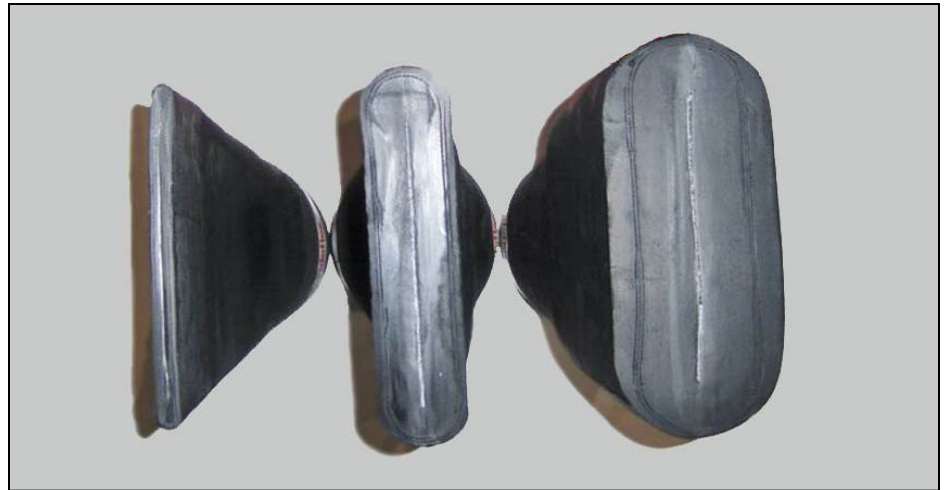


Hydraulic Variations

- With the extensive amount of data collected, Tideflex Technologies develops modeling programs which allow us to select the optimal check valve for your unique application needs.
- Tideflex Check Valves are not “one size fits all.”

Hydraulic Variations

- There are up to fifty different variations of check valves within each nominal size. Each variation has its own hydraulic characteristics for headloss, jet velocity, effective diameter and backpressure rating. This is achieved by changing the geometry and relative stiffness of the valve.



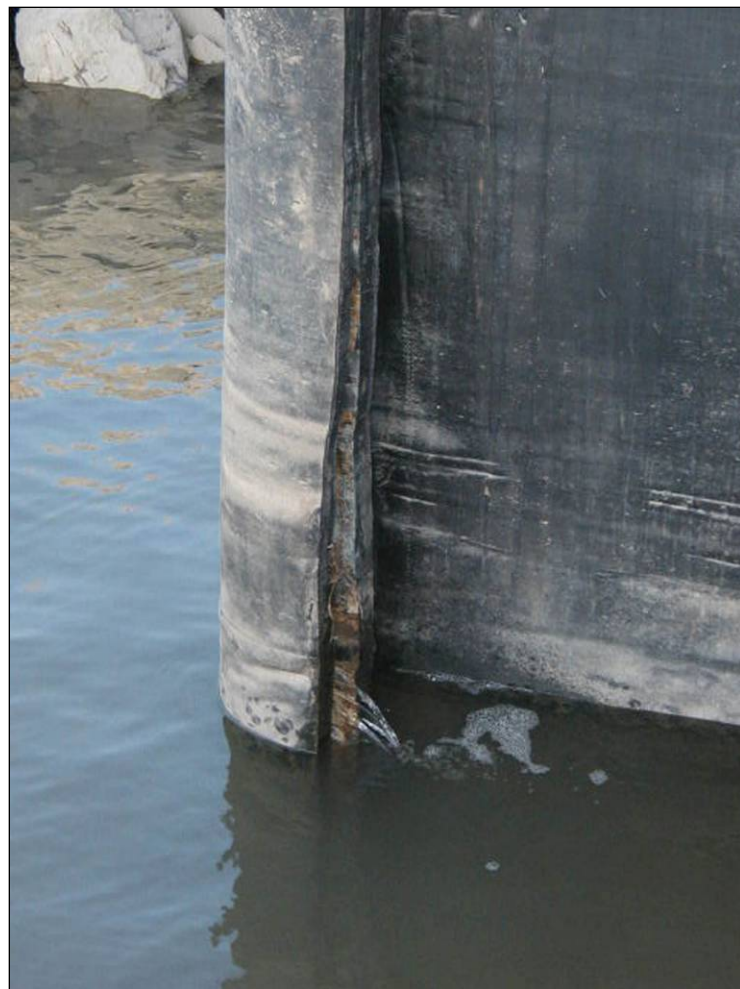
Curved Bill Design

- As part of Tideflex Technologies' commitment to continuous testing and design improvement, our check valves now feature a patented Curved Bill as standard or as an option.
- The Curved Bill allows us to build a more resilient valve. This reduces headloss across the valve and increases the sealing area. As a result, the Curved Bill returns to a closed position more naturally when compared to the original Straight Bill Tideflex Check Valve design.



Curved Bill Design

- The Curved Bill design increases the sealing area by 50%. This allows the valve to form a tighter seal around debris and solids.
- The Curved Bill enhancement is self-draining and does not increase headloss.
- In fact, headloss is significantly lower with a Curved Bill.



Tideflex TF-1 Check Valve

- Our most significant technological advancement occurred when Tideflex Technologies tested, patented and introduced the Eccentric TF-1 Check Valve.
- More than ten years before the original TF-2 Check Valve patent had expired, the Eccentric TF-1 Check Valve was introduced because it is stronger, has less headloss and addresses the needs of installations with minimal bottom clearance.

Tideflex TF-1 Check Valve

- Independent hydraulic testing.
- Curved bill design enhances sealing.
- Significantly lower headloss.
- Improved structural integrity.
- Eccentric flat-bottom design.
- Less bottom clearance required.
- Increases flow capacity.



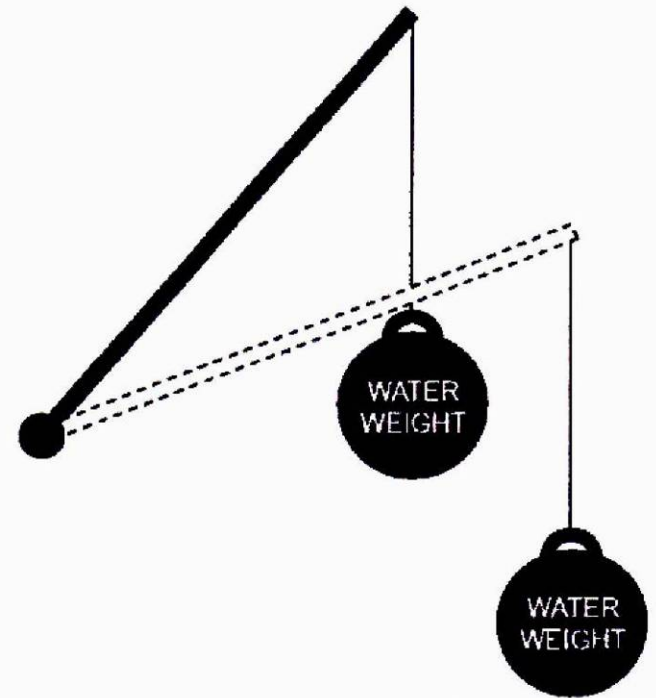
Tideflex TF-1 Check Valve

- The Eccentric TF-1 Check Valve is ideal for applications such as junction boxes, diversion chambers and interceptors where the invert of the pipe is close to the floor of the vault. These structures are designed to maximize the available gravity head, thus the pipe invert is as close to the floor as possible.



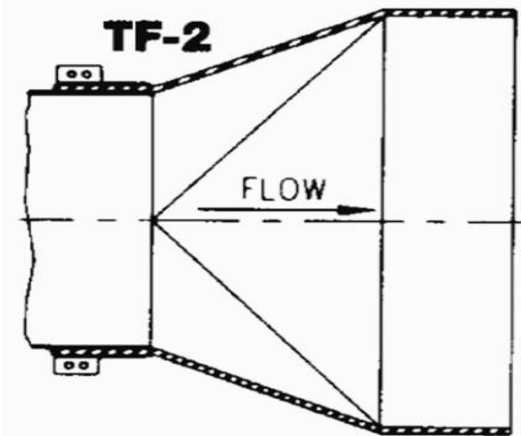
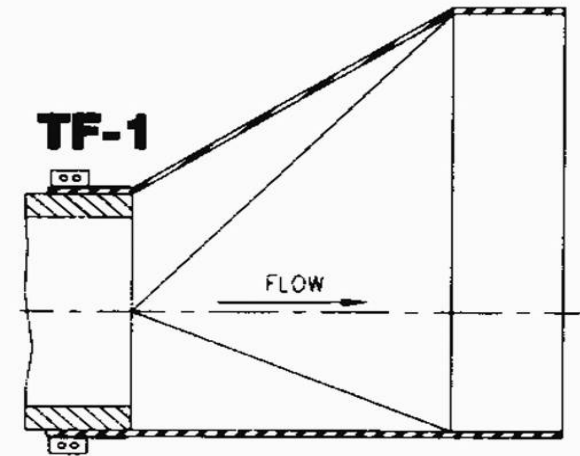
Geometry and Improved Structure

- Whether slip-on or flanged, Eccentric TF-1 Check Valves are cantilevered when installed at the end of a pipe, flange or headwall.
- Only the Eccentric TF-1 is able to withstand the weight of the valve and the weight of water inside the valve with significantly less deflection.



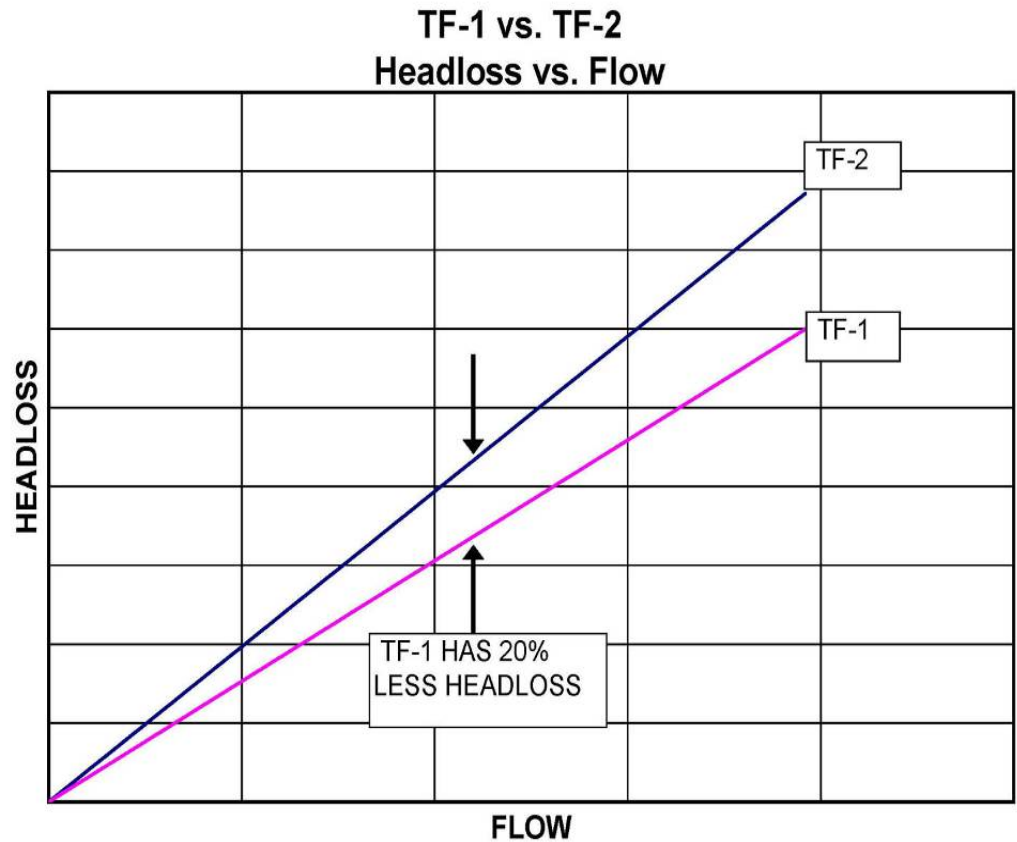
Geometry and Improved Structure

- The TF-1's eccentric geometric design and increased spine angle maximize the structural integrity and performance of the valve. As a result, the eccentric TF-1 has been proven to deflect 30-40% less than the TF-2, minimizing the possibility of sagging.

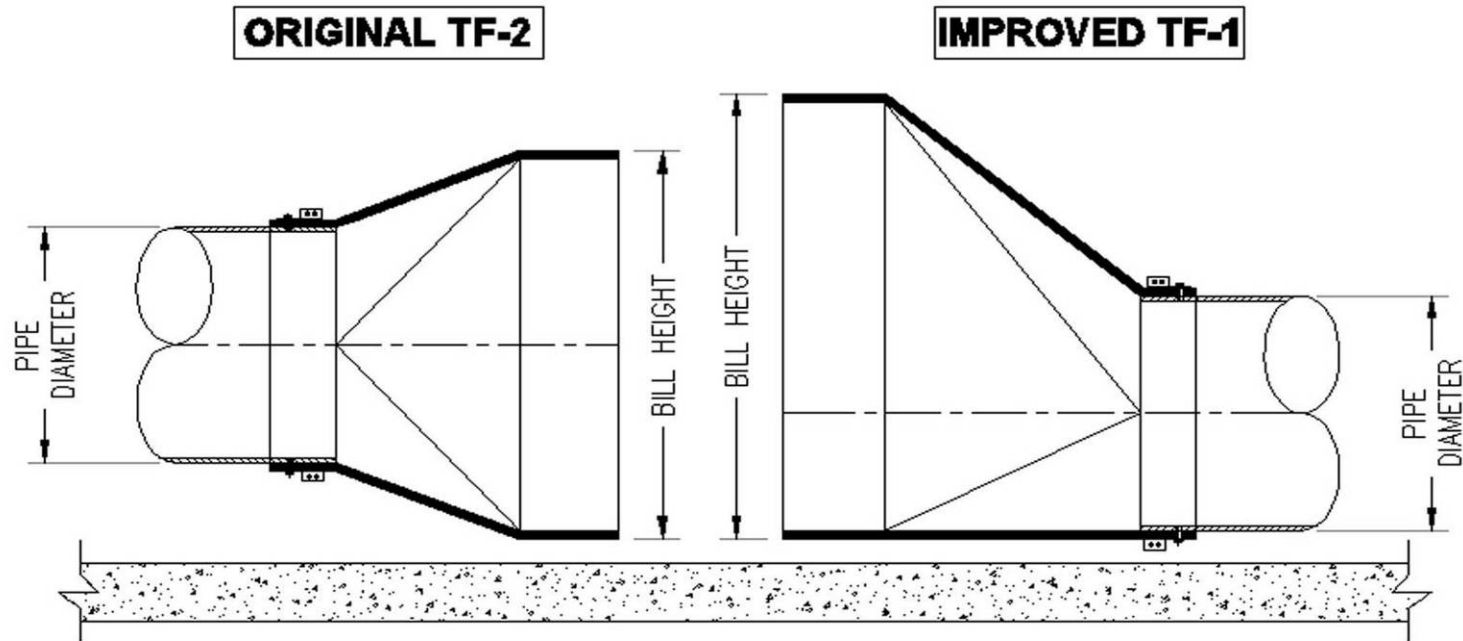


Increased Bill Height Reduces Headloss

- To properly specify an Eccentric TF-1 Check Valve you must state the minimum valve height requirement.



Increased Bill Height Reduces Headloss



- With a maximized Bill Height that increases the effective open area, headloss in the Eccentric TF-1 Check Valve is significantly reduced. This unique feature improves flow capacity.

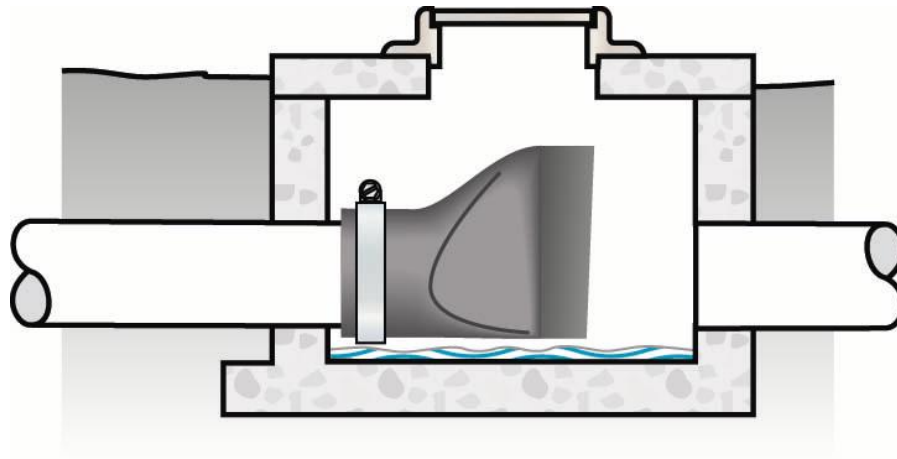
Increased Bill Height Reduces Headloss

VALVE SIZE	TF-2 HEIGHT	TF-1 HEIGHT	HEIGHT DIFFERENCE	TF-1 HEADLOSS REDUCTION
12"	20"	23"	3"	32%
24"	39"	43"	4"	21%
36"	63"	70"	7"	23%
54"	80"	90"	10"	26%
90"	124"	145"	21"	36%

- Increased Bill Height gives the TF-1 significantly lower headloss than conventional straight bill check valves.
- Valves with low headloss require less pumping, resulting in substantial savings in energy costs.

Increases Flow Capacity

- In structures, the eccentric TF-1 Check Valve does not require as much clearance below the pipe invert which minimizes the amount of debris, sand and sediment that can get trapped.

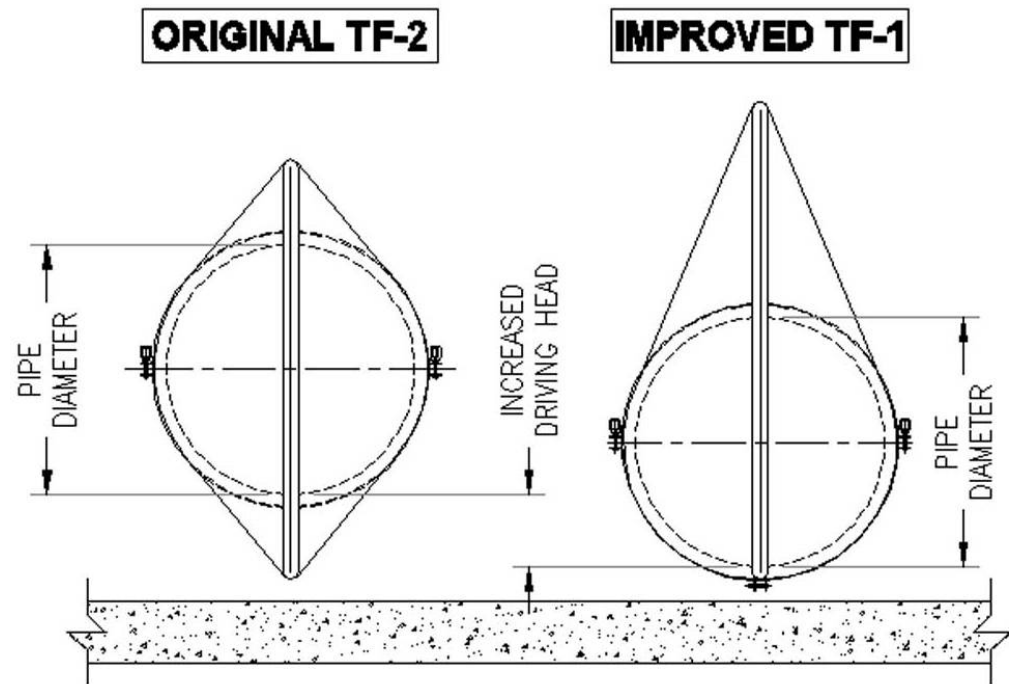


Increases Flow Capacity

VALVE SIZE	TF-2 HEIGHT	TF-1 HEIGHT	TF-1 INCREASED DRIVING HEAD
12"	20"	23"	4"
24"	39"	43"	7.5"
36"	63"	70"	13.5"
48"	80"	95"	16"
90"	124"	145"	17"

Increases Flow Capacity

- The TF-1 allows installation in existing structures without the need to break up the concrete floor to achieve bottom clearance. For new structures, construction costs are reduced because the required depth is minimized.



Customer Testimonial #1

- *“Recently, the City of Monongahela has converted from using the original Tideflex Check Valve (TF-2) to the TF-1 new Eccentric Style with the Curved Bill. We have found that the eccentric valves have lower headloss and the curved bill provides a more effective seal because of its significantly larger sealing area. Tideflex Check Valves have become an integral part of our regional conveyance projects and have saved us money with reduced maintenance and operational costs”.*

Ed White,
Plant Superintendent
City of Monogahela, PA

Proven Product Enhancement

- The Curved Bill design offered exclusively by Tideflex Technologies will not hinder or effect the ability of the valve to open and close, especially in areas where there is sand or silt present.



Customer Testimonial #2

- Recently a major Regional Council in Queensland, Australia, installed three different sized Curved Bill Tideflex TF-1 Check Valves along their coastline.
- Areas along this coastline deal with low-lying land, tidal inlets, sand drifts, high tides and cyclonic rainfall. This means that stormwater drainage outlets are often submerged or buried, making it difficult to ensure stormwater drainage and discharge to the ocean.

Customer Testimonial #2

- The Council said *“They [Tideflex] do not get blocked, allowing stormwater to be used to clear away sand when the outlet is buried. There are a number of problems with many traditional stormwater outlets which include being buried by sand with tidal drift causing stormwater flooding and allowing saltwater intrusion into the stormwater drainage system and inundating low lying land.”*



Customer Testimonial #2

- *“With the moderate rainfall received recently, we witnessed them [Curved Bill Tideflex TF-1 Check Valves] working to remove the sand surrounding the buried valves to allow the water to discharge to the ocean.”*



Customer Testimonial #2

- *“Previously this has taken a crew and backhoe a number of hours to free the water each time it has either rained or been buried. This is just another example of working smarter and using best practice.”*



Don't be Fooled By Other Manufacturers

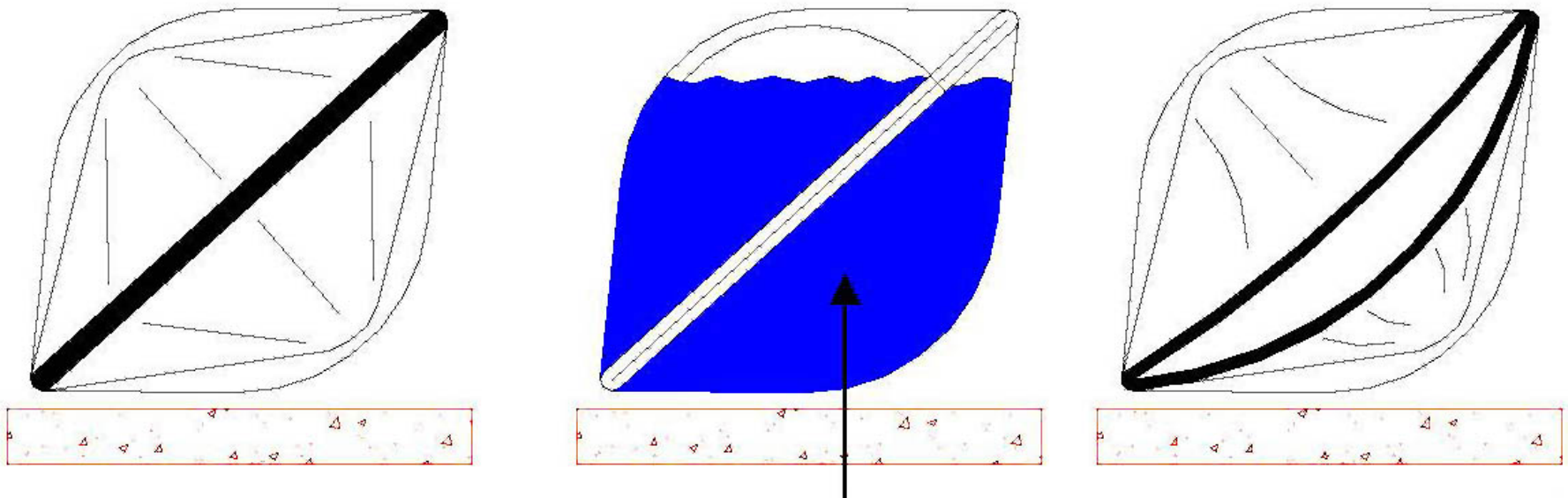
- To gain bottom clearance when installing rubber “duckbill” valves, other manufacturers will compromise your design and installation by wrongfully advising you that their valves can be rotated up to 45° from vertical.
- In sizes 12” and larger, all valves that are installed in a rotated position will distort, gap open and leak. Most importantly, any rotation compromises the structural integrity of the valve due to an unequal distribution of valve and water weight.

Don't be Fooled By Other Manufacturers



Don't be Fooled By Other Manufacturers

- The eccentric TF-1 Check Valve's flat bottom design allows us to keep the bill in the vertical position and eliminate the possibility of the check valve distorting and gapping open.

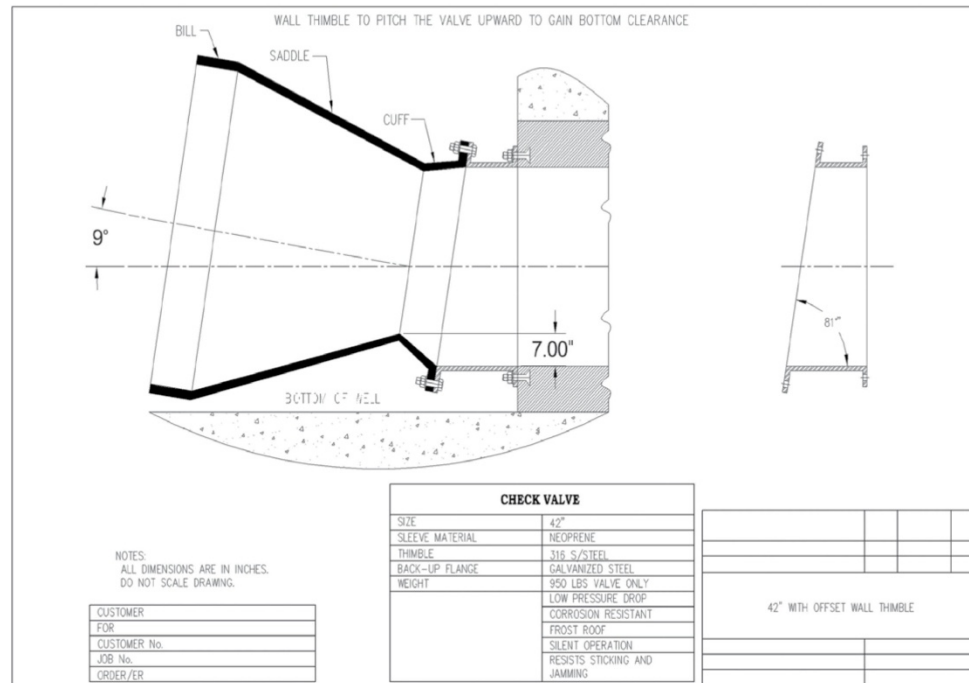


Dangers of Altering Pipe Pitch

- Another tactic used by other manufacturers is to recommend installing non-eccentric duckbill valves using methods that change the pitch of the pipe, as shown in the illustration below. The invert of the pipe has been raised. This will rob available driving head.

Dangers of Altering Pipe Pitch

- Not only does pitching the check valve create greater headloss, it also allows for standing water to collect inside the pipeline. Standing water will collect and stagnate, at the cuff and where the saddle meets the bill. The saddle angles downward past the cuff, which will also trap sedimentation and debris.



Dangers of Reducing Cuff Adapters

- Duckbill valves with a reducing cuff have appreciably greater headloss because the valve and its bill height are physically smaller.
 - This alternative is less expensive because the valve uses less materials and takes less time to manufacture.
- Unless specified otherwise, the standard offered by competing duckbill manufacturers is to provide a smaller duckbill valve with a reducing cuff.

Dangers of Reducing Cuff Adapters

- Tideflex Technologies owns mandrels from 1/2"-96". This allows us to build full-sized valves every time. Other valve manufacturers construct undersized duckbill check valves due to limited tooling. They will then pass the smaller duckbill check valve off as a larger sized valve by simply providing a step-up cuff adapter.



This competitor's 20" check valve was sold as a 30" valve.

Reducing Cuff Adapters Increase Headloss

Competitor A



Reducing Cuff Adapters Increase Headloss

Competitor B



Reducing Cuff Adapters Increase Headloss

NOMINAL PIPE I.D.	RCP O.D.	TF-1 HEIGHT BASED ON PIPE I.D.	TF-1 HEIGHT BASED ON PIPE O.D.	HEADLOSS REDUCTION	APPROX. PRICE DIFFERENCE
12"	16"	23"	30"	41%	20%
24"	30"	44"	55"	36%	20%
30"	37"	55"	70"	38%	20%
48"	58"	81"	90"	19%	20%

Understand the Difference

- Improperly sized check valves result in:
 - ✓ Increased headloss.
 - ✓ Decreased flow capacity.
 - ✓ Raised invert elevation.
 - ✓ Ponding water in the pipe.
 - ✓ Entrapment of sediment and debris.
 - ✓ Valves that are prone to inversion.

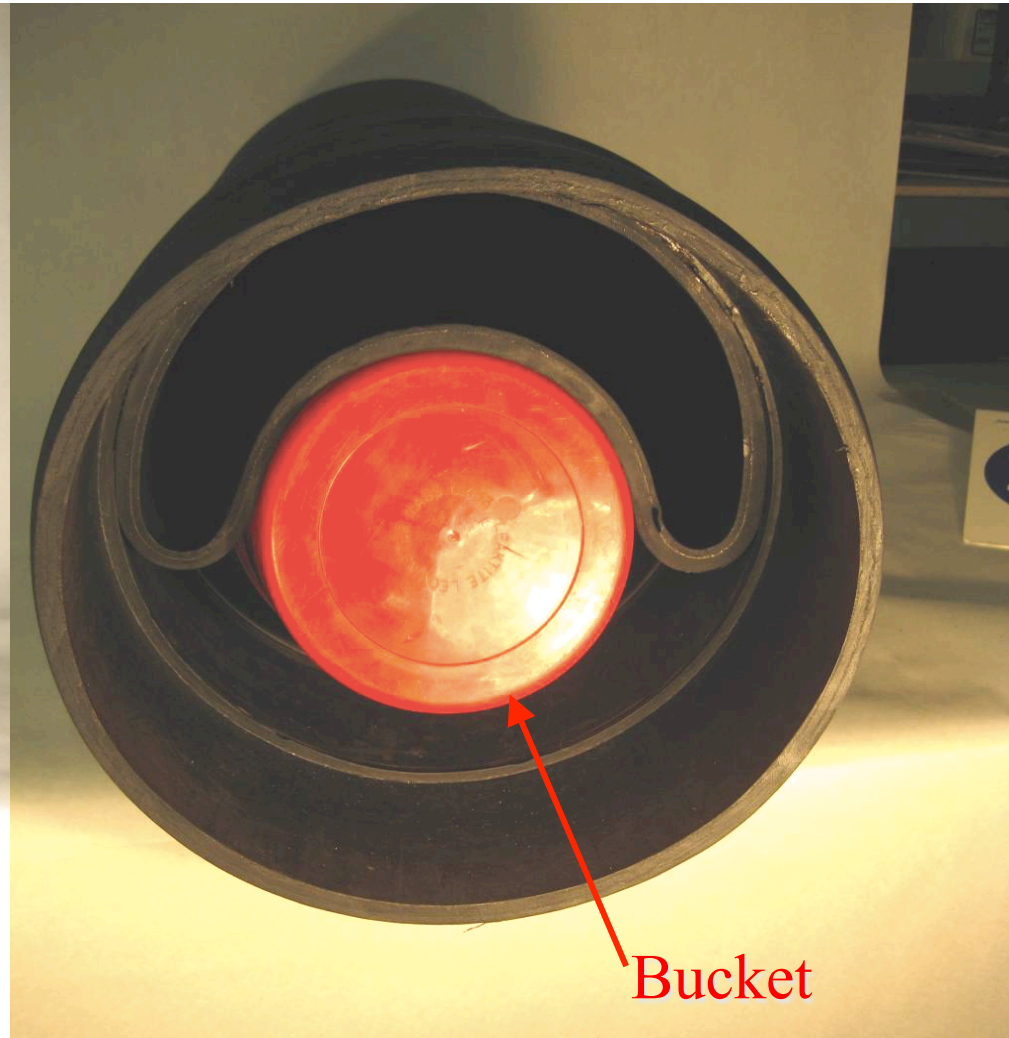
Inline Check Valve Improvements

CheckMate Inline Check Valve:

- Installed inside the pipe so nothing hangs off end of pipe
- Lower headloss than duckbill check valves
- Various installation options (expansion clamps, flanged, etc.)

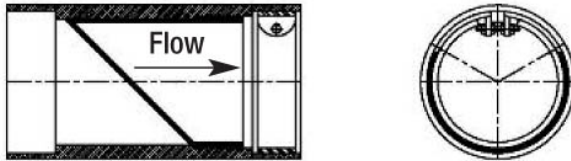


CheckMate Inline Check Valve

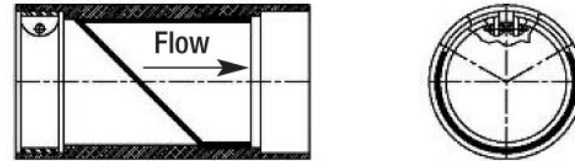


CheckMate Installation Options

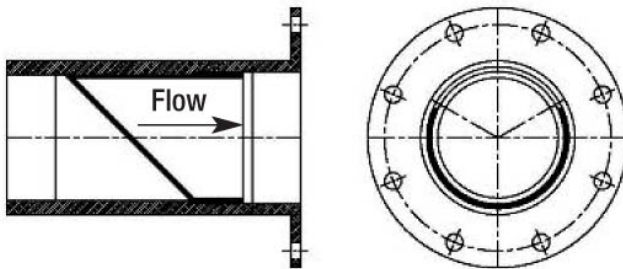
Downstream Clamp



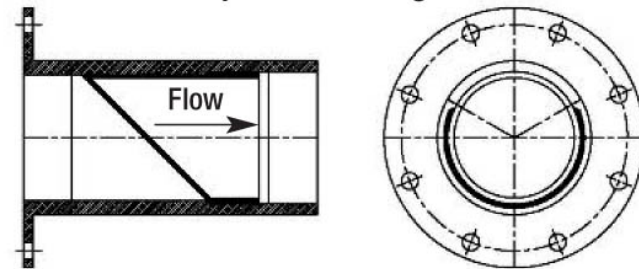
Upstream Clamp



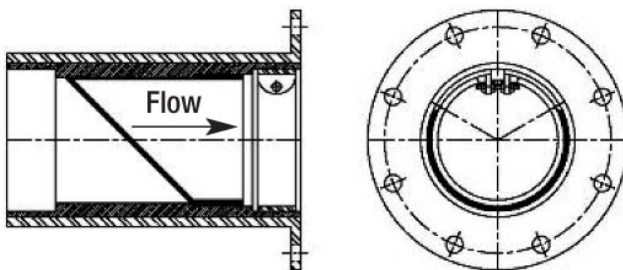
Downstream Flanged



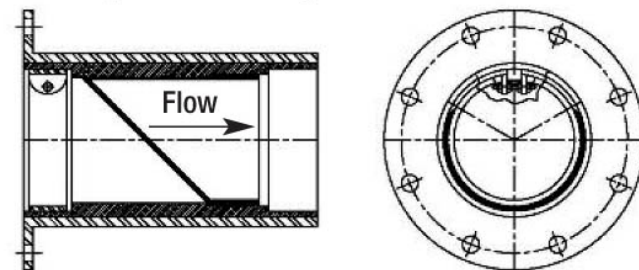
Upstream Flanged



Downstream Flanged Thimble Insert



Upstream Flanged Thimble Insert



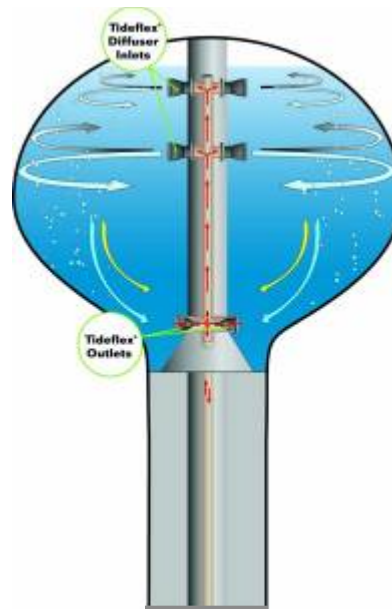
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Mixing
System**



**Series 39
Check Valve**



**Waterflex®
Check Valve**



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Assembly**